

## **ABSTRACT**

Isoelectronic co-doping of semiconductor compounds and alloys with deep acceptors and deep donors is used to decrease bandgap, to increase concentration of the dopant constituents in the resulting alloys, and to increase carrier mobilities lifetimes. Group III - V compounds and alloys, such as GaAs and GaP, are isoelectronically co-doped with, for example, N and Bi, to customize solar cells, thermal voltaic cells, light emitting diodes, photodetectors, and lasers on GaP, InP, GaAs, Ge, and Si substrates. Isoelectronically co-doped Group II - VI compounds and alloys are also included.